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MEDICUS

TYPHOID FEVER IN PHILADELPHIA.

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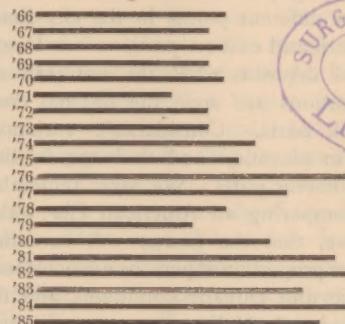
It appears from a study of the mortality returns, that the chances of life are a little better in Philadelphia than in many other large cities. The rough conclusion drawn from inspection of comprehensive totals gives, however, a very incomplete notion of the degree of sanitary perfection or imperfection in any community. To secure an insight into the extent to which so-called preventable disease prevails, we require a careful topographical and statistical study. It was intended, in the present paper, to give the results of such a study of all the principal zymotic diseases in Philadelphia for a given time, together with local and social features bearing upon this subject; but the task has proved too extensive for the time at disposal, and I am compelled to lay before the members the results of an incomplete investigation; but I think, even in this form, it will be not unimportant.

A topographical study of the location of contagious or infectious disease is no new sanitary method. Even with reference to Philadelphia, this has been done several times. A committee of the State Medical Society* presented such a report some years ago, and Dr. R. A. Cleemann made a similar study in 1876.† The epidemic of yellow fever in 1870 was also carefully analyzed.‡

In view, however, of the great progress that has been made lately, in the methods of study of infectious disease, and of the intense local agitation concerning the sanitary condition of Philadelphia, it seemed to me that the investigation might be again undertaken, and profitably carried much further than in the previous attempts. Compelled to limit my work, I selected the cases of typhoid fever in 1884, and of the last six months of 1885, and carefully transcribed from the records the sex, age, nativity and residence of every person reported as dying from typhoid fever in this city in that

period. The records of the Health Office are kept in admirable order by the Registrar, Mr. Geo. E. Chambers, and I take this opportunity of expressing my indebtedness to him for the facilities which he afforded me, and for the patience with which he has endured my presence for hours at a time during his office work.

The disease in question has been gradually growing in frequency, at an irregular rate, in this city, and is now, if we take the general mortality returns from various foreign and American cities, out of proportion to our population. The figures, as given in the Health Reports, may be rendered more intelligible by means of a diagram:—



The high figure for 1876 (761 deaths) is explained by the peculiar and overcrowded condition of the city in that year, but the rapid and sustained increase from 1880 to the present time is not susceptible of such explanation.

The figures of these years show the disease to be more prevalent in Philadelphia, or at least more fatal, than in most large cities. It is not advisable to burden the reading with an array of figures, but I may take, as illustration, the city of Paris, from which I have for the present year weekly returns, covering a period of fifteen weeks, beginning June 15th, 1885. The total deaths from typhoid in Paris, with a population above 2,260,000, was 389. In Philadelphia, with a population of about 925,000, the deaths were 193. If the proportion of deaths was the same in both cities, those in Philadel-

* Transactions Medical Society of Penna., 1876.

† Proceedings College of Physicians of Phila., 1876. Report of Board of Health of Phila., 1876.

‡ Report of Board of Health of Philadelphia for 1870.

phia would be less than 160. Comparisons with other cities show substantially the same fact.

In judging of the cause of this condition, we must consider and examine into many points. In all sanitary examinations, I think it well to keep in view the remark of a sarcastic French writer, "that nothing can lie worse than figures, except facts."

The city of Philadelphia is peculiar in several ways. It is spread over a large extent of territory, perhaps larger than any other city. It is claimed to constitute the largest manufacturing district on the continent, and although this has been disputed, being claimed for New York, yet there can be but little doubt that, in proportion to population, it is the larger. Mr. Lorin Blodget, who is thoroughly familiar with the industrial statistics of this city, informs me that the northeastern section, including principally the Nineteenth, Twentieth and Thirty-first wards, represents an extent and rapidity of development unequalled by any city of the world.

The topography and soil conditions are very different at different points in the city limits. The southern and eastern portions are located on alluvial deposits, while the northern and western portions are upon the original continental rock basis. Considerable variations, therefore, in elevation and drainage facilities exist in different parts. We must remember, also, in comparing an American city with a foreign one, that the former will contain a much larger proportion of persons unaccustomed to the habits and climatic conditions, and that malarial and typhoid disease are more likely to affect such persons than those born on the soil.

The complete investigation of the subject involves a large amount of labor. The records of the Health Office, although collected with care, and sufficient for the practical purposes of the Board, are yet but a skeleton of the body of facts necessary. We would need, above all things, a complete record of cases, whether fatal or not, a verification of diagnosis in a certain proportion of cases, an outline of the sanitary surroundings of each instance.

In the actual performance of the task I undertook, I have been thwarted by some minor difficulties, but not to such an extent as to invalidate the general conclusions. In a few instances, the residences were not recorded, in quite a number the streets were obscure, or

their names duplicated in different parts of the city. I traced out a fair proportion of these cases to a certainty. I have, however, learned of a source of error which must seriously impair any attempts at topographical study, unless the method of reporting deaths is radically changed. Among the points of interest in the work, was to ascertain how frequently two or more cases would be found in the same house, and especially if fatal cases so occurred. I found several instances. From 1139 North Third street, 1215 Girard avenue, and 1002 South Fourth street, three deaths were reported. I expected that a sanitary examination of these premises, would be of value, but was rather surprised on discovering that the first two were residences of undertakers, and the residence given in the return was, therefore, merely the place from which the interment took place. Several other cases which I followed up turned out to have been reported from places not connected with the origin of the disease.

I present herewith a map of the built-up portions of the city, with the location of the fatal cases marked.* (See p. 5.)

An examination of the statistics goes to show that the district north of Girard avenue, and between Ninth street and Frankford avenue, presents always the most unfavorable showing. It was the district that suffered most from cholera in 1866, from smallpox in 1872-3, and 1881-2; its death-rate from all diseases, and from specially zymotic diseases, is higher than in most other sections.

If we look carefully into the conditions which prevail in this section, I think we can discern, if not all causes of the excess in mortality, at least many of them.

The section is comparatively newly occupied territory. The population is largely composed of foreign-born persons, many of them imported especially for the manufacturing operations carried on in the district, and of about the age at which the fever appears to be most frequent.

The condition of the drainage, both natural and artificial, is of the most objectionable description. The ravines and meadows constituting the original water-courses have been filled up, for street extension, without proper care, and as a large portion of the material which is used for filling up is house and mill refuse,

* At the reading of the paper, the map shown was that of the cases for 1884. The map herewith published is for the latter half of 1885.

many of the rows of houses have been built over garbage. Dr. Wm. R. Cruice, who has had a large experience with the diseases of this section, has given me a description of the situation.

The question of water-supply must, of course, enter largely into our thoughts in investigating this subject. There is a large and, I think, increasing number of sanitarians and physicians who regard the disease as strictly a germ disease, that is incapable of originating except from a previous case. To these the hypothesis of water-carriage is entirely acceptable, and they would regard the above-mentioned soil, climatic and social conditions, as merely predisposing. The Kensington district has, for a long while, been supplied with Delaware water, and by general consent, the disproportionate amount of diarrhoeal disease, has been ascribed to this fact. Yet, we cannot overlook the fact that the district of Kensington proper, now substantially included within the Eighteenth ward, does not show a specially high death-rate from typhoid. The high death-rate is seen particularly in the district which has been laid out and built up since the war.

I am inclined to think that if water-carriage is an active factor, in this case, in the distribution of zymotic disease, it takes place in a manner different from that usually supposed. The consumption of water in mills is an important item, and the high taxes imposed by the city for water privileges has led to a very extensive sinking of shallow wells for general mill supply. I have examined a number of samples so obtained, from different parts of the city, and as might be expected, the water generally shows evidence of contamination. It is, however, frequently quite clear and cool, and the mineral matters and gases contained in it give it a pleasant taste, for which reason the operatives prefer it to the river water; and I know that such well water is often used even after it has been expressly pronounced unsafe. There is reason to believe that several slight local epidemics may be traced to such a cause. Recently such an outbreak occurred at the Glen Echo carpet mills, in the lower end of Germantown, and all the deaths occurring in the Twenty-second ward during November and December, 1885, were of persons employed in those mills. Dr. J. Howard Taylor, Medical Inspector of the Board of Health of this city, and myself, investigated the epidemic, and could find no other source but the drinking of well-water.

Dr. E. Frank Garrett writes, in reference to a death occurring in Germantown earlier in the year, that although no other person had the disease in the same house, there were several in the same square, and all of them used well-water. I think considerable importance ought to be attached to the nativity of those affected. The foreign-born population of the district that suffers most from the disease is not only large in proportion, but in many cases of the quite recent arrivals. They are the operative class, and are, indeed, the actual specimens of the "pauper labor" of which so much is said in tariff discussion. This class is not certainly in the best physical condition, and being new to the district, are all the more likely to succumb. I find, by examining the figures for six months of 1884, that the proportion of foreign-born persons dying of typhoid fever is much larger than the proportion dying of all diseases.

The statistics, in my opinion, entirely negative the hypothesis that Schuylkill water is an important factor of the disease. This view has, indeed, never been tenable. No analysis of the water has justified the wholesale condemnation of it which has been so frequent of late years. The distribution of the mortality from zymotic disease has been several times examined, with a view to show such a connection, but it has failed. The report of the water department for 1883 presents an examination of this question, and it fails entirely to make out a case against the Fairmount supply.

It would be impossible to discuss a topic like this without saying something about sewer-gas, or rather, as it ought to be called, sewer-air. When I was a medical student, the sewer theory of infectious diseases was a favorite one. My preceptor, the late Dr. Rand, laid much stress upon this agent as a cause of disease. We have recovered from this extreme state of alarm, and some of our leading sanitarians now teach that it can only act as an exciting cause where it carries specific germs.

As in the case of the Schuylkill water, the topographical study of typhoid fever in Philadelphia does not bear out the theory of sewer-air as a cause. The districts in which the residences are most extensively connected with sewers, through the medium, not only of water-closets, but of those much more insidious routes, the wash-stand and kitchen-sink, are just the districts in which the fever is least prevalent. An inspection of the map will show that in the section from Seventh to Twenty-

second, and from Market to Spruce, scarcely a death has occurred.

There is but one death registered the entire length of Chestnut street, from Broad to the river, and this was a young lady who had just become a resident.

Unfortunately for the thoroughness of such statistics, the deaths only are accessible in the health records. I am of the opinion that, except possibly in times of epidemics, there is no disease in which it is more important to report the cases. In most cities that have efficient sanitary service this is done, and I think Philadelphia is decidedly behind the times in not enforcing such a method. With a view of ascertaining how far the deaths might represent infected localities, and also learning the prevailing opinion among those who had to deal with the disease, I addressed notes to about sixty-five physicians who had reported deaths, enclosing a postal card, bearing these queries: Was there any other case of the disease in the same house at or near the time of this death? Do you know of any possible source of infection? Was the disease contracted in the city? I have received returns from about fifty-five, several answering at length.

From these answers I learn the following points:—

That the fever is generally solitary, that is, only one person is affected in each house. That most, but by no means all, of the cases are contracted in the city. That, in a certain proportion, the diagnosis is uncertain or obscure, and that occasionally a malarial condition seems to precede the true typhoid state. That the prevailing idea as to source of infection seems to be soil pollution, especially by cess-pools. There is but little disposition to ascribe it to water supply or to sewer-gas proper.

Just as I was adding the concluding lines to this paper, I received the very interesting essay on cholera, by Dr. J. M. Cunningham, Sanitary Commissioner with the Government of India. This work, which represents thirty-three years' experience with cholera, has been made the subject of extended review, by Pettenkofer, in the *Archives of Hygiene*. I refer to this work here, because I regard the sanitary bearings of typhoid fever as analogous to those of cholera; in fact, Mr. Ernest Hart, editor of the London *Sanitary Record*, has stated that, where typhoid fever is prevalent, cholera is likely to be most serious, which accords with

our own experience. Now, there is, perhaps, a further analogy in these diseases. They may be both due to a specific germ, which may be carried by water or air; but they are not contagious in the ordinary sense; and the liability to them, both by individuals and by districts, is dependent on many accessory conditions. Pettenkofer is convinced of the important part played by the condition of the soil in the spread of typhoid and cholera, and Cunningham's facts bear out this view very strongly. We have it upon the best authority, that in several large European cities, *e. g.*, Dantzig and Munich, the diminution of the typhoid death-rate was coincident with the improvement in drainage, but decidedly not with that of the water supply.

In connection with the work of examination of the Health Records, several ideas for improvement in the method of reporting, suggested themselves to me. The method of reporting by wards is very unsatisfactory. The outlines of the wards represent no natural or social divisions. They are mere political expedients. A system of classification by sanitary districts of uniform size would be much more satisfactory. All deaths in Hospitals should, if possible, be referred back to the original residence, not credited to the Hospital. It would be an advantage if the attending physician should be charged with the furnishing of the details of statistics, in place of the undertakers, who now have the duty.

I have offered this paper almost entirely as an opportunity for discussion. The statistical element in it is too slight to constitute a basis for sound theory, though it may serve to overturn some views and suggest others. I would like to hear from the members on the following points:—

What is the probable percentage of fatal cases in typhoid, in this city?

How far are the conditions of soil pollution, or insufficient and defective sewerage, answerable for the disease?

Is the prevalence of the disease due in notable proportion to the foreign population settled with us?

Would it not be advisable for the Board of Health to require reports of all typhoid cases?*

The discussion on the paper is given in a somewhat condensed form, on account of lack of space.

* The Board has recently passed a resolution to this effect.

BROAD STREET.

AVENUE.

LEHIGH.

FRONT STREET.

The map represents the distribution of two hundred and eleven deaths from typhoid fever out of the two hundred and seventy-eight occurring in Philadelphia in the last six months of 1855. The sixty-seven not entered consist of deaths in West Philadelphia, Frankford, Germantown, Manayunk, or extreme outlying districts, also deaths in hospitals, and a few of uncertain location. The limits of the map include a pretty closely built-up district, about four miles long by two broad, containing a population which may be roughly estimated at seven hundred thousand.

MARKET STREET.



DISCUSSION ON TYPHOID FEVER IN PHILADELPHIA.

DR. F. P. HENRY, in opening the discussion, by request of the chair, said: Dr. Leffmann speaks from the standpoint of the health officer rather than that of the clinician. The subject of etiology is usually divided into predisposing and exciting causes, and prophylaxis may deal with the protection of the community or of the individual, although both are intimately allied. I propose first to say a few words upon individual predisposition.

There can be no doubt that certain individuals have a tendency to neuroses, congestions, catarrhs, in the infra-diaphragmatic portion of the trunk, just as others have similar tendencies in its supra-diaphragmatic portion. In such constitutions diarrhoea is produced by causes which, in the average individual, would be followed by no such effect: such as an unusually hearty meal; the partaking of food difficult of digestion or of food that is easily digestible, but of a kind to which the individual is unaccustomed; a change in the customary drinking water, or, finally, and very commonly, atmospheric changes, thermometric and hygrometric. Now this susceptibility can be only dependent upon an unusually sensitive condition of the abdominal sympathetic system. Abnormal fluxions of blood to the abdominal vessels are the result of irritants which, in individuals of more stable equilibrium, would be considered physiological. Among such irritants is possibly the poison, the germ, of typhoid fever. We are all acquainted with single cases of typhoid in families where all have been exposed to precisely similar influences. Why is it that, in these sporadic forms of the disease, the majority of those exposed to the infection escape? It is because the germ finds a favorable soil in one person and not in another, and this soil is a catarrhal mucous membrane, which very catarrh is produced by the irritation of the poison, so that in individuals of the type above described the germ of typhoid fever flourishes because it is able to produce its own culture medium, namely, a catarrhal mucous membrane.

Another cause favoring the development of the typhoid germ, and, I believe, through the medium of abdominal hyperæmia, is change of climate. Dr. Leffmann has confirmed my observation, made in a general way, of the large proportion of foreigners attacked with typhoid fever in a certain section of this city, that in which the Episcopal Hospital is situated. In a ten years' service at that institution, I have yearly observed a large proportion, if not a preponderance, of Germans and Englishmen—mostly weavers—among the cases there treated.

Several observers, among them Virchow, have shown that typhoid fever is more prevalent during dry seasons, which is in strict accord with the celebrated observations of Pettenkofer and Buhl, that,

in Munich, the number of cases of typhoid fever bears a relation to the height of the winter springs, being most prevalent when these are low. These Munich observers do not believe in the propagation of the typhoid poison by means of the drinking water, and explain the undoubted coincidence between the prevalence of typhoid and a low level of the subsoil water by the theory that when the earth is uncovered by the recession of the water the air gains access to germs previously submerged, and stimulates them to unusual activity. The poison, they say, gains access to the body through the medium of the atmospheric air.

DR. HENRY B. BAKER, Secretary of the Michigan State Board of Health, has recently verified the statements of Pettenkofer and Buhl, that the rise and fall of the typhoid fever curve are in inverse ratio to the rise and fall of the subsoil water, with the following notable exception, namely, that in winter, when the ground is deeply frozen, a low level of subsoil water does not correspond with an increased prevalence of typhoid.

DR. CRUICE.—I wish simply to say that the cases which I have treated during the last summer were not among immigrants. The majority of them were old residents in the neighborhood, and many of them were workers in the mills. A large number of the residents along Germantown Road use pump water. I have no doubt that much of the trouble has come from that source. These cases occurred in newly-built districts. A number of the houses were built on ground made from the dumping of ashes and other debris. I observed the same condition in 1872, when I treated a number of cases of smallpox.

DR. RICHARD A. CLEEMANN.—I am glad to see that the observations of Dr. Leffmann confirm those which I made in the epidemic of 1876. It was at that time very unpopular to say that typhoid fever was not caused by contamination of sewer gas or from the water supply. Careful examination then showed that neither the sewers nor the water supply could be held responsible for the large majority of deaths from typhoid fever in Philadelphia.

In the absence of any apparent cause, I was disposed to refer it to emanations from the number of open cesspools, which were often in close proximity to the houses, and to the constant pollution of the soil from them, which became very obnoxious, from the subsequent turning up of this soil.

In regard to the point of Dr. Henry in reference to the ground water, no observations have been made in Philadelphia. In 1876 we had a condition of affairs which, I suggested, might account, to a certain extent, for the typhoid fever. There were heavy rains, followed by extremely hot weather. I think that at that time I established the fact that there is no condition more predisposing to a typhoid epidemic, other things being equal, than extreme and long-continued heat.

I might say, in regard to cesspools as a cause of typhoid, that in Paris much the same condition occurs. I was surprised to hear Dr. Leffmann say that the deaths in Philadelphia were more numerous than in Paris. My memory would contradict him.

However, the prevalence of typhoid in different cities is a good deal a matter of registration. In New York, we find many deaths attributed to malaria. I have little doubt that in Philadelphia a great many of those cases would be classed as typhoid fever. At the Health Office here it is customary to register all deaths from typho-malarial fever as from typhoid fever.

A broad, particularly in Germany, I have noticed many cases called gastric fever, which here would have been called typhoid fever.

In regard to the death rate, I should say, from my own observations of hospital and private cases, the death rate is about ten per cent., which is about the same as that in London.

I do not deny that the poison of typhoid fever can be communicated through water. On the contrary, I think that it is often carried in that way, but that in Philadelphia polluted water is not a prominent cause. In all the epidemics from poisoned drinking water, the number attacked, among those who drank the water, has been very large, a very much larger proportion of the inhabitants than have ever been attacked in Philadelphia by typhoid fever.

DR. EDWARD T. BRUEN.—I think that the point which Dr. Leffmann made, in regard to referring hospital deaths to the residence of the patient, is very important. Taking Blockley Hospital, for example, it is rare to have a case of typhoid fever developing in the institution; most of the cases are brought from the outside.

The modern consensus of opinion points to the fact that the disease does not arise without the presence of the poison. It does not arise *de novo*. In regard to the influence of cesspools, I had an opportunity of observing a number of cases of the disease originating near Rosemont Station. Most of these cases occurred from a centre near which a large number of houses had recently been built, some twenty or twenty-five, on an acre of ground. These were occupied by the working class. The privy-wells and water-wells had been sunk near by.

DR. JAMES C. WILSON.—In regard to the death-rate of typhoid fever, I am disposed to think that it is under-estimated in this city. It is possible that some of the deaths occurring from the accidents of the fever are reported under such heads as peritonitis, hemorrhage from the bowels, etc. A recent careful study of this subject, in New York, by Dr. Delafield, showed that the death-rate varied in different years between twenty and thirty per cent.

The second question of Dr. Leffmann relates to the

relative frequency of typhoid fever in this community, among newly-arrived individuals. Such individuals are particularly subject to this disease. This was seen three or four years ago, in the Paris epidemics. It was observed that those who came in from the country were especially liable to contract the disease, and to have it in a grave form. This is also the case in our own city. I think that this is not only true of localities, but also of houses. I have in mind at present two houses in which I have seen enteric fever develop in a number of individuals, at intervals in the course of a series of years. In one of these houses, of three cases, two were in individuals who came from a distance, and in a few weeks or months developed the disease. These cases occurred at intervals of eighteen months or two years. Local defects of plumbing are usually largely concerned in establishing foci of infection.

The more closely we study the etiology of enteric fever, the more obvious do the means of its conveyance from one individual to another become, and the more manifest becomes the necessity for the immediate and effectual disinfecting of the discharges from the bowel. It is one of the highest duties of the physician to see to it that no case becomes a centre of new infection. It seems to me that some of the views which have been alluded to to-night do not require any special discussion, in view of the experience in Plymouth. The causal relations of the epidemic there were so clear as not to admit of the slightest question as to the manner in which the disease may be and usually is conveyed from one locality to another, namely, by individuals sick of the fever or by the alvine dejections from such individuals.

The satisfactory solution of the etiological questions can, I think, only be arrived at, in a city like this, by carrying out the suggestion of Dr. Leffmann, that not only the fatal cases, but every case of enteric fever should be reported, with full details concerning the locality in which it took origin. One source of error in our statistics is the failure to recognize the fact that enteric fever, like other infectious diseases, presents different forms. In typhoid fever we have a typical form from which there is, however, the widest variation. Among the atypical forms may be mentioned infantile remittent, the abortive form, mild typhoid and typhoid fever of old age.

I believe that enteric fever is capable, in the course of time, of being stamped out. The conveyance of the infecting principle from one individual to another is so plainly the cause of it, that it is not Utopian to hope that the immediate and effectual destruction of that principle, by means of the disinfection of the stools in every case, would gradually lead to the extinction of this disease in the civilized world.

DR. S. S. COHEN.—In regard to the causation of enteric fever by the water supply, I recall two cases

that I saw last year, in one family living in the Nineteenth ward. These persons had for three weeks used water from the well of a factory where the father worked, having been frightened by the newspaper accounts of the pollution of river water. Two sons were taken with mild typhoid, and a daughter with non-febrile diarrhoea. I could find no source of infection other than the drinking water. In regard to this district, I may say that we see, at the Jefferson Medical College clinic, a good many cases of "walking typhoid," in residents of the northeastern part of the city. We also see some few cases in residents of the "Neck" district. It is from these same localities that we get the greatest number of our malarial cases.

DR. WILLIAM M. WELCH.—Some years ago, when undertaking to study the statistics of typhoid fever in Philadelphia, I asked a physician in the Pennsylvania Hospital to look up for me the death-rate in that institution, and he informed me that it was fifteen per cent. There is no doubt but that the death-rate in hospitals is always much higher than in private practice. Dr. Pepper stated on this floor, some three or four years ago, that of 100 cases treated by him only three died. This, surely, is a remarkably low death-rate.

In seeking for the cause of typhoid fever, we must look to the soil and drinking water. Whenever soil,

especially polluted soil, is upturned to any considerable extent there is pretty sure to be typhoid fever.

DR. CHARLES CLAXTON.—In my experience, as resident of the Episcopal Hospital and in private practice in the Nineteenth ward, I have seen many cases of typhoid fever. The almost invariable source of infection I have found to be defective sewerage, usually from exposed privy wells. Such is the condition in some of these residences, that during a heavy rain the contents of these wells are flooded into the yards, and thence into the cellars, where they would remain for long periods. I have now under my care four members of one family, whose sickness is undoubtedly due to this wretched state of affairs. The mortality in typhoid at the Episcopal Hospital, for the last ten years, has been a fraction over 13 per cent.

DR. CHARLES WIRGMAN.—In 1876, a Russian man-of-war, with five hundred men on board, anchored off Brown street. In a short time, three cases of typhoid fever were brought to the Pennsylvania Hospital, at which I was a resident, from this ship. Every day more were brought, until the number reached above twenty. Of this number four died. These men were drinking Delaware water. They were not on shore much, and were not likely to be where they could contract the disease. It is probable that the water was contaminated by a sewer which opened at this point.